

September 2003

TECHNICAL MANUAL CONTRACT REQUIREMENT (TMCR) TSM-03
FOR THE
TRANSITION SWITCH MODULE PROGRAM

TECHNICAL MANUAL CONTRACT REQUIREMENT

TRANSITION SWITCH MODULE

SUBJECT: REQUIREMENTS FOR DELIVERY OF A SYSTEMS OPERATOR'S & MAINTENANCE ELECTRONIC TECHNICAL MANUAL (ETM) WITH COMPONENTS INVENTORY AND REPAIR PARTS LISTS (-14&P) IN ENHANCED PORTABLE DOCUMENT FORMAT (PDF) FILES DELIVERED ON CD-ROM

SCOPE: This Technical Manual Contract Requirement (TMCR) document presents requirements for preparing the subject manual. The files used to produce the ETM shall be delivered in the most current version of Microsoft (MS) Word or compatible files, on CD-ROM, to Marine Corps Systems Command (MARCORSYSCOM) only. System component-associated commercial manuals shall be provided in soft copy on the systems ETM CD-ROM using enhanced portable document format (PDF) files. Each CD ROM shall have Adobe Acrobat Reader installed on each CD-ROM to enable the user to read the ETM by using the CD-ROM only. Commercial manuals shall be reviewed to ensure the Marine Corps can properly support all subsystems. Recommendations shall be made to the Government if the Contractor concludes that supplementation may be required. The ETM CD-ROM shall have a label identifying the system, technical manual number and Publication Control Number (PCN). The CD-ROM case shall also have a label or cover with system specific information. The Contractor shall deliver final draft ETMs for use with prototype hardware systems. The contractor shall deliver final production ETMs (to include changes resulting from training, tests, reviews, and hardware changes) for delivery with production hardware systems. MARCORSYSCOM will be the approving authority for finals prior to publication. The Software User's Manual, a separate requirement in the contract statement of work, shall be included on the ETM CD-ROM.

1.0 DATA ITEMS. Data Items shall be delivered in accordance with the distribution matrix as listed on the Contract Data Requirements Lists (CDRL).

2.0. APPLICABLE DOCUMENTS. The following documents were used to establish the requirements of this TMCR to the extent covered herein and shall be used as **guidance** in the development of the system ETM.

2.1. Government Documents

SG-1A	U.S. Marine Corps Style Guide
MIL-PRF-38784	Standard Practice for Manuals, Technical: General Style and Format Requirements
MIL-HDBK-1221	Department of Defense Handbook for Evaluation of Commercial Off-The-Shelf (COTS) Manuals
MIL-STD-1840	Automated Exchange of Technical Information
MCO P5215.17	The Marine Corps Technical Publication System
MCO P4400.150	Consumer-Level Supply Policy Manual
TM 4700-15/1	Ground Equipment Record Procedures

2.2. Commercial Documents

ASME Y14.38M Abbreviations and Acronyms

3.0. REQUIREMENTS. The requirements of this TMCR shall take precedence over any other document pertaining to technical manuals.

3.1. Technical Manuals Quality Assurance Data. The Contractor shall be responsible for the quality of the technical information and digital data provided by subcontractors and vendors. Refer to Section 4.0.

3.2. Technical Manuals

3.2.1 Systems Operator's and Maintenance Manual (-14&P). The Contractor shall develop a combined Operator's and Maintenance ETM with Components Inventory List and Repair Parts List for the TSM Suites. The manual shall be written in simple, practical English and provide system and subsystem oriented instructions for packing and unpacking, setup and teardown and any special precautions or procedures for system shut down, installation, operations, troubleshooting and tests, and maintenance of the TSM Suites.

The TSM is comprised of three suites of equipment: 1) the Deployable End Office Suite (DEOS), 2) the Deployable Integrated Transport Suite (DITS), and 3) the Remote Subscriber Access Module (RSAM). Each of the suites may be employed separately or in combination with each other as the operational requirements dictate and shall be addressed as such in the ETM.

Each operator and maintenance task shall be presented in detail and in logical, systematic steps for the work to be accomplished. The maintenance instructions shall accurately provide the technician with all the information needed to keep the equipment operational. The ETM shall provide system and subsystem oriented instructions for installation, operation, maintenance, and test of the TSM suites. It will contain a Components Inventory List that can be used as a tool for performing inventories and record keeping. All tools and test equipment required to accomplish any maintenance or installation shall be identified as part of the task. To the greatest extent practical, Government furnished materiel, Government technical manuals or Government-approved commercial operation and maintenance manuals, shall be used as references for system and subsystem maintenance.

Margins on each page shall not be less than one half inch. All terminology, symbols, and abbreviations shall be readily understandable by operators and maintenance personnel. Use of abbreviations shall be held to a minimum and shall be defined the first time they appear. Abbreviations used shall be in accordance with ASME Y14.38M.

3.2.2. Commercial Manuals. Commercial manuals shall be used when available. The manuals shall contain all technical information on the assembly, installation, operation and parts to support operation and maintenance. If the Contractor determines that commercial manuals are not complete, the Contractor shall develop new information to be incorporated into the commercial manual that is incomplete. Commercial manuals shall be submitted to the Government for review and approval within 60 days after Critical Design Review (CDR) at which time the Contractor has identified vendor equipment as system components. The Contractor shall submit commercial manuals, with supplementation as required, for review and acceptance. During review, the Government may determine that supplementation is required, see the following subparagraph.

The Contractor shall deliver all associated commercial manuals in PDF format on the CD-ROM containing the system ETM. These manuals shall be linked with the references used in the system ETM.

NOTE: If the original equipment manufacturer provides only a hard copy manual, the Contractor shall convert the document to PDF files for inclusion on the system ETM CD-ROM.

Written copyright release shall be provided concurrently with each final commercial manual, supplemented or not. The copyright release shall specify that the Government has permission to reprint or duplicate as needed.

3.2.3. Supplemental Information. In the event the Government determines that supplementation is required to make the commercial manual acceptable for Government use, the Contractor shall prepare supplementation in the same format as the system manual. The Contractor shall submit draft supplementation within 60 days after Government request for supplementation. The Government requires 30 days for review of original submission or revision. The manual may be supplemented with existing data to support operation and maintenance. Should the required supplemental data be so extensive that clarity could not be preserved, the Contractor will be directed to prepare a new manual, in ETM format, to be included with the system ETM. MIL-HDBK-1221 may be used as a **guide** for preparation of supplementation. **Warning** and **Caution** statements will be added as required for the protection of personnel and equipment.

3.2.4. Manuals for Review. During reviews, the ETM shall be presented in its most current stage of development. Corrections resulting from in-process reviews, testing (Contractor or Government), validation and verification shall be included. The Government requires 30 days for review/approval/disapproval. The ETM, **validated** by the Contractor and **verified** by the Government, shall be fielded with the system equipment. Upon completion of Validation, the Contractor shall provide a **Validation Certificate** testifying to the completeness, accuracy and safety of the ETM (See 4.1.4). An authorized authority of the company must sign the Validation Certificate and it may be in Contractor furnished format.

3.3. ETM Front Cover and Front Matter Format and Style

3.3.1. Front Cover. The statement FOR OFFICIAL USE ONLY shall appear on the front of all unclassified manuals, CD-ROM jewel cases and CD-ROM labels. The phrase 'UNCLASSIFIED DATA" shall be placed on the label of all unclassified CD-ROM disks. The following distribution and destruction statements shall be printed on the front of all unclassified manuals and CD-ROM jewel case inserts. The statements shall be centered, below a Marine Corps seal (See Attachment 1 for CD-ROM label and case insert samples).

DISTRIBUTION STATEMENT: THIS PUBLICATION IS REQUIRED FOR OFFICIAL USE OR FOR ADMINISTRATION OR OPERATIONAL PURPOSES. DISTRIBUTION IS LIMITED TO U.S. GOVERNMENT AGENCIES ONLY. OTHER REQUESTS FOR THIS DOCUMENT MUST BE REFERRED TO: COMMANDANT OF THE MARINE CORPS (ARD), WASHINGTON D.C. 20380-0001.

DESTRUCTION NOTICE: DESTROY BY ANY METHOD THAT WILL PREVENT DISCLOSURE OF CONTENTS OR RECONSTRUCTION OF THE DOCUMENT.

3.3.2 Front Matter. Front matter for the systems manual shall contain a recapitulation of **Warnings and Cautions** cross-referenced to the text by page number. Front matter shall consist of:

- a. Cover
- b. Warnings and Cautions
- c. Table of Contents
- d. List of Illustrations
- e. List of Tables
- f. Safety Summary

3.3.3. Publication Numbers. The Government will assign a unique Marine Corps technical manual number and a unique PCN to the ETM. The technical manual number shall be placed on the top of all pages (frames) of the ETM. The PCN shall be placed on the lower right hand corner of the front cover only. Also, the technical manual number and the PCN shall be placed on the label and jewel case container of the CD-ROM.

3.3.4. Publication Date. The publication date shall be the copy freeze date, which is an engineering cutoff date established by the procuring activity. No hardware changes will be incorporated into the publication after the copy freeze date. The publication date shall be shown in the lower right hand corner of the front cover only.

3.4. ETM Technical Content/Format and Organization

3.4.1. Contents. The system manual contents shall be arranged according to the following:

- Chapter 1 - General Information
 - Chapter 2 - Safety Precautions
 - Chapter 3 - Installation Data
 - Chapter 4 - Functional Description
 - Chapter 5 - Operation
 - Chapter 6 - Scheduled Maintenance
 - Chapter 7 - Fault Isolation
 - Chapter 8 - Alignment Procedures/Corrective Maintenance Procedures
 - Chapter 9 - Repair Parts list
 - Appendix X - Reference Publications
 - Appendix X - Expendables/Durable Supplies and Materials
- List
- Appendix X - Tools and Test Equipment
 - Appendix X - Components/Inventory List
 - Appendix X - Glossary

NOTE

Wherever practical, to facilitate ease in use, the Contractor shall incorporate into the ETM the use of operation and maintenance flow charts or diagrams rather than textual information.

3.4.2. Chapter Requirements

Functional Organization

a. The -14&P system ETM shall use digital photographs or illustrations integrated with procedural and maintenance tasks, text, and the parts list.

b. Digital photographs and illustrations will show the relationship of components to an assembly and parts to a component.

c. Digital photographs and illustrations shall be keyed in procedural or disassembly sequence.

d. Line drawings shall be prepared and used in cases where photographs are not clear. It must be understood that clarity shall be the object.

e. Photographs or line art, including schematics, wiring diagrams, and block diagrams, shall be of sufficient darkness and sharpness of line to reproduce clearly at required reproduction size without additional treatment. Nomenclature, callouts, tabular material, and symbols appearing on illustrations shall be upper case, with eight point minimum reproduced size.

3.4.2.1. Chapter 1 - General Information. Chapter 1 shall describe the system in general physical and functional terms as specified below.

a. Introduction. The introduction shall define the system and its relationship with other systems. The mission of the system shall be stated. A diagram showing the interrelationships of the system equipment shall support the text. The major functional relationship and input/output to related systems shall be indicated.

b. Physical Arrangement. System areas and compartments shall be described and the system equipment and units contained in the areas shall be listed. The physical arrangement and description shall be supported by illustrations.

c. System Equipment. Each equipment subsystem comprising the system shall be identified and described. An illustration/picture shall be placed prior to the description. Descriptions of operator-attended equipment shall include general statements as to the nature and purpose of units and indicators. The text shall be supported by digital photographs/illustrations. All equipment shall be shown, whenever possible, in relative scale proportions. A piece of equipment may be separately illustrated with significant features called out, if such details are necessary for proper support of the text.

d. Associated System Equipment. When required, descriptions and illustrations of associated system equipment shall be limited to the major units thereof. The descriptions shall be more condensed than those of subject system equipment; otherwise, the same requirements are applicable. In the descriptions, emphasis shall be placed on those associated systems equipment that constitute operational or functional interfaces with the subject system. Such units shall be included in the system digital photographs/illustrations.

e. Reference Data. Reference data shall include a list of the equipment comprising the system describing descriptive and functional characteristics. The list shall contain nameplate data such as nomenclature, manufacturer and common names, abbreviated or informal nomenclature, and system characteristics.

f. Capabilities. A summary of system capabilities shall be provided.

3.4.2.2. Chapter 2 - Safety Precautions. Chapter 2 shall describe the hazards associated with system operation and maintenance. Any hazards identified in the Safety Assessment Review (SAR) shall be incorporated. To permit wide and unrestricted use, chapter 2 should contain only unclassified information.

a. Introduction. This description shall orient system supervisory personnel, and shall include the following:

(1) Purpose, scope, and organization of the system safety instructions.

(2) Basic safety concept.

(3) Basic responsibilities for safety.

b. Electromagnetic Radiation Hazards and Precautions. If applicable, describe the radiation hazards to personnel and the precautions to be taken. The hazards of radiation to flammable or explosive materials also shall be described. The description shall include discussions of, locations, minimum safe distances, and precautions to be taken when entering areas of radiation hazard.

c. System Hazards and Precautions. Descriptions of system hazards and precautions shall be included, addressed to system personnel and referenced to particular system equipment. The descriptions shall be organized to be consistent with the operation of the system. The descriptions shall supplement and extend equipment safety instructions to the system level, by warning of potential hazards that can be caused during operation or maintenance.

d. Operational and Maintenance Safety Summary. A summary shall be included which emphasizes the proper use of equipment controls, describes the hazards to operators and maintenance personnel, or as applicable, the hazard to persons in areas remote from the operations, and recommended precautions. An emergency operational routine shall be included which emphasizes the controls that permit immediate shut down of the system.

e. Hazardous Components. Identify and briefly describe the hazardous components including radioactive devices and elements used with the system and summarize the general handling precautions for such components.

3.4.2.3. Chapter 3 - Installation Data. Incorporate installation drawings and information as appropriate. System installation data shall include, but is not limited to, the following:

a. Electrical Power Requirements. Identify the electrical power requirements for the system and each system component. Include nominal input voltage requirements along with percent of variance that can be accommodated and whether or not the system component has an auto-sensing feature. Also, provide power requirements in terms of volt-amps.

b. Interconnection Diagrams. Interconnection block diagrams shall be presented. Show each piece of equipment as a block. A cable number shall identify all cables running between equipment. The number of active and spare leads in each cable shall be included. The illustrations shall also indicate all junction boxes, switchboards, etc., into which interconnection cables enter or leave.

c. Cable Run Diagrams. Isometric diagrams shall be used to indicate the location of all cable runs between compartments or areas. Each cable run diagram shall indicate by compartment

identification for location of all cables shown on the interconnecting diagrams.

d. System Cable Interconnection Check. Cold-wire check procedures shall be provided to verify the proper installation of all system cables. These checks shall be conducted with all power off and all equipment completely shut down.

e. Active System Test. All active system test procedures required to verify the proper installation and operation of the system shall be included. Reference may be made to applicable tests and procedures in Chapter 6. Procedures for complete setup, testing, shut down, and data analysis shall be provided.

f. System Component Installation Procedures. Complete systematic, step-by-step instructions shall be provided for installation of system components not covered in any of the equipment manuals for the equipment comprising the system. The following types of supplemental information not provided in the equipment technical manual shall be included:

- (1) Instructions required to assemble components.
- (2) Instructions and diagrams required to install components.
- (3) Instructions for making electrical and all other interface connections between equipment, components, and other systems.
- (4) Servicing procedures.

g. Installation Drawings. The following drawings shall be included:

- (1) Pictorial diagrams.
- (2) Outline and mounting dimension data.
- (3) Interconnecting wiring and cabling diagrams.
- (4) Primary power distribution.

h. Installation Checkout. Systematic, step-by-step, procedures shall be provided to demonstrate that the system

operates correctly, safely, and within tolerances. These procedures shall provide for system checkout as follows:

(1) Installation inspection and pre-energizing procedures.

(2) Turn-on and preliminary tests.

(3) Installation verification tests.

i. Test Procedures. Testing procedures shall be presented in a logical order as follows:

(1) Energize the system.

(2) When test results are within the required tolerance, include a reference to the next logical test. When test results are out of tolerance, include a reference to the corrective maintenance or troubleshooting data. Reference shall be made to troubleshooting diagrams except where probable causes of failure can be predicted in which case reference may be made directly to a repair procedure.

3.4.2.4. Chapter 4 - Functional Description. Chapter 4 shall describe how the components jointly performs major operations and functions and how associated systems contribute to the performance of these major functions. Equipment or associated system interfaces shall be described only as necessary to identify the sources or destinations of system inputs and outputs. Description shall not repeat the functional description provided in the equipment manuals.

a. Method of Presentation. The presentation shall first define how the system's major functions meet the purpose of the system. Each major function shall then be discussed separately at progressively increasing levels of detail. A basic block diagram of the system shall support the description of the entire system. Where textual information can be enhanced pictorially, additional diagrams and other illustrations shall be used. In electronic manuals the same diagram can be incorporated for use throughout the manual (one illustration - multiple links, when possible).

b. Introduction. The introduction shall describe the general approach that is used in the functional description.

The introduction shall also describe briefly the interrelationship between the system and associated systems.

c. System Function Directory. A system function directory shall tabulate operation control functions and the signal data described in the detailed level of functional analysis. The tabulation shall include, but is not limited to, the following information, as applicable:

- (1) Official function name, common name, and symbol.
- (2) Type of control or signal (e.g., AC frequency and voltage, DC polarity and voltage).
- (3) The origin and termination of the control or signal.
- (4) Identification of equipment (e.g., relay transmitters, coordinate converters, distribution boxes, switches, and the like) between the origin and termination of the output control or signal.
- (5) Figure numbers of illustrations on which the function is illustrated, including the fault isolation diagrams in Chapter 7.

3.4.2.5. Chapter 5 - Operation. Chapter 5 shall describe system operating modes and procedures. The descriptions shall be detailed to the level required for an understanding of the operational interfaces of the system equipment and associated systems. Illustrations shall be included when necessary for clarity. The various operating modes shall first be described to acquaint the operator with all equipment combinations that can be employed to affect a given mode of operation.

a. Preoperational Conditions and Setup. Specific preoperational conditions presumed to be in effect prior to system operation shall be established. A system readiness check off list of significant switch positions and indicator status shall be tabulated. The initial conditions of associated-system equipment that directly affect system operation shall be treated in a similar manner.

b. Operating Modes. The primary operating mode shall be discussed in detail, and alternate modes shall be treated as modifications of the primary mode. Operating procedures common

to all modes shall be detailed under the primary mode and referred to under the alternate modes, with such modifications of procedure as may be necessary. Each mode shall be described in the logical sequence of major phases, events, options, supervisory commands and responsive actions, and the following:

(1) Only equipment operational controls and indicators having system significance shall be explained in the description. When controls must be actuated and indicators observed in a sequence to achieve system operation, the descriptions will cite each control and indicator with a number to indicate the position in the sequence.

(2) Emphasis shall be placed, by the use of warnings and cautions, on the safe operation of controls, which if operated improperly, could result in hazards to personnel or damage to the equipment. Embedded warnings and cautions shall precede the operational step. Each control shall be followed by a brief description of its effects at the operator station and at remote stations. The primary mode description shall be supported by both general and detailed illustrations.

(3) Operational phases that involve the operator's judgment shall be illustrated by operational logic diagrams. The diagrams shall indicate the conditions that must be favorable prior to an operator action, or if unfavorable, indicate the alternate action. Illustrations that show dials, gages, status lights, etc., shall indicate the favorable or unfavorable conditions that apply. Special procedures to be followed when an equipment failure may be bypassed (as separate from emergency procedures) shall also be described.

d. Normal Operation. The duties of system operators shall be described in terms of general responsibility and specific systematic, step-by-step procedures for operating the system in all of the primary modes. Descriptive words (such as switch, button, dial, or indicator) may be added to clarify the type of control involved, for example: "press ACCESS button and observe channel spot". All system controls and indicators provided for the use of operators shall be covered. Controls and indicators provided only for maintenance and nonsystematic application shall not be called out.

e. Emergency Operation. Systematic, step-by-step procedures shall be provided for emergency operation of the system. If specially designated controls have been provided for

emergencies, a short statement shall be included describing how they modify or otherwise affect normal system operation. Emergency procedures shall be supported by illustrations.

f. Special Operation. Special operations such as test checkout, training, or evaluation exercises shall be described. Illustration support shall include block diagrams and line drawing diagrams.

3.4.2.6. Chapter 6 - Scheduled Maintenance. Chapter 6 shall contain all scheduled maintenance procedures for the system, together with necessary explanations and illustrations. These procedures shall be correlated along with the installation checkout requirements, such that any maintenance or performance test procedures also required for checkout may be properly referenced from chapter 3, Installation Data. The Installation Standards Summary Sheet shall also include space for any maintenance or performance test result that should be recorded by the installer. The recorded information will provide a reference to the technician when troubleshooting, or when needed for installation acceptance certification. Chapter 6 shall contain, but is not limited to, the following:

- (1) Introduction.
- (2) Tools and Equipment.
- (3) Scheduled maintenance action index.
- (4) Scheduled test procedures.

a. Introduction. The introduction shall be an explanation of the purpose, scope, and arrangement of the scheduled maintenance material. When a preventive maintenance procedure is critical to the operation of the system and the schedule for servicing is absolute (not recommended), this information shall be conspicuously written as a CAUTION. The following statement shall be included: **"The scheduled maintenance instructions in this manual are intended to duplicate those furnished in Planned Maintenance Checks System (PMCS)."** In case of conflicts, the PMCS documentation takes precedence. Such conflicts should be reported immediately on the user comment sheet in accordance with the maintenance procedures for this manual.

b. Tools and Equipment. This section specifies the tools and equipment to be issued to maintenance personnel.

Illustrations are provided showing the use of any special tools or equipment that is used in a special way for adjustment or calibration.

c. Scheduled maintenance action index. This index shall include all required scheduled performance tests. The index shall be tabulated as follows:

(1) Column 1, Interval. This index shall contain a list of all scheduled actions contained in the chapter. The following symbols to indicate the interval, as appropriate, shall be used:

<u>Interval</u>	<u>Symbol</u>
Daily	D
Weekly	W
Monthly	M
Quarterly (3 Months)	Q
Semiannually (6 Months)	S
Annually (12 Months)	A
Overhaul cycle	C
As specified (explain)	R

(2) Column 2, Maintenance action. This column shall list the title of the maintenance action, which corresponds to the interval number in column 1.

(3) Column 3, Reference. This column shall state the paragraph or table number of the maintenance procedure that corresponds to the maintenance action listed in column 2.

d. Scheduled Test Procedures. Include the detailed procedures for setting up and performing complete system tests. Each procedure shall be numbered and titled to clearly define the test action and the output to be tested. Safety precautions, tools and test equipment and any preliminary set-up data required to perform the test shall be included.

3.4.2.7. Chapter 7 - Fault Isolation. The major objective of the system fault isolation procedures shall be described along with a brief description of each type of maintenance diagram. This chapter shall contain fault isolation procedures, illustrations and an explanation of the use of the information presented. In addition, this chapter shall contain a fault directory that relates fault symptoms found during operation to

the fault-isolation procedures. Fault-isolation procedures, fault logic diagrams, control function diagrams, and data function-diagrams shall be included as follows:

- (1) Operation-based symptom fault directory.
- (2) Fault-isolation procedures.
- (3) System fault logic and troubleshooting maintenance dependency matrix diagrams.
- (4) System control function diagrams.
- (5) System data function diagrams.

a. Operation-Based Symptom Fault Directory. The directory shall relate system faults observed during operation described in chapter 5 to fault isolation diagrams. The table(s) shall include references to system fault isolation diagrams, and where applicable, directly to equipment troubleshooting diagrams. The content of the table shall include, as applicable, the following information:

- (1) Operating procedure step.
- (2) Functional description.
- (3) Fault isolation procedure.
- (4) Alignment procedure.
- (5) Fault isolation diagram.
- (6) Equipment document.

b. Fault Isolation Procedures. Procedures shall be included for isolation of a trouble to a single equipment or functional area of equipment. The procedures shall provide for the analysis of switching combinations and observable indications (dials, gauge lamps, and meters). The use of any required test equipment shall be described. The procedures shall support the fault-logic, control-function, and data function diagrams. The supporting diagrams shall be referenced by figure number. Prerequisite control settings and conditions shall precede each procedure.

c. System Fault Logic and Troubleshooting-Maintenance Dependency-Matrix Diagrams. System fault logic diagrams shall be prepared for fault indications observed during either scheduled tests or operation. These diagrams shall isolate the functional area of the equipment at fault and then refer the user to the equipment technical manual containing the information needed to complete the fault isolation and repair. Each diagram shall include or refer to information necessary to establish the system test or operating conditions required for starting the fault-isolation procedure. The conclusion boxes shall list the equipment or functional area within and equipment that is the probable source of malfunction and the technical manual reference or references for further isolation and repair of the fault. Troubleshooting-matrix diagrams may be substituted for or augment fault logic diagrams.

d. System Control Function Diagrams. Control function diagrams shall be provided for all system control circuits. The control function diagrams shall be at the system level. The diagrams shall show essential fault isolation test points or comparable indicators, and shall include appropriate references to equipment manuals.

e. System Data Function Diagrams. Data function diagrams shall show in detail the system information needed to isolate faults within signal or data flow paths. Data function diagrams shall include tolerance values and shall contain references to equipment publications where necessary. All inputs required to develop the output shall be shown.

3.4.2.8. Chapter 8 - Corrective Maintenance. Chapter 8 shall contain instructions required to:

a. Adjust and align the equipment to include all modules, subassemblies, and assemblies.

b. Remove and replace all repairable parts.

The instructions must identify the actions to be accomplished; safety precautions to be observed; and tools, parts, materials, and test equipment required. Step-by-step maintenance procedures, in disassembly and reassembly order, for any and all items of equipment (which are part of the system) not covered by individual manuals (government or commercial) must be included in this chapter.

3.4.2.9 Chapter 9 - Repair Parts List. This chapter provides a list of spares and repair parts required to maintain and support this equipment. They authorize the requisitioning and issue of spares and repair parts as indicated by the source, maintenance, and recoverability (SMR) code. The pages list spares and repair parts authorized for use in the performance of maintenance. The list also includes parts, which must be removed for replacement of authorized parts. Parts lists are composed of functional groups in alpha sequence, with parts in each group listed in Figure and Number sequence. This listing comprises the main part of the Repair Parts Listing. (See Attachment 2 for an example). It consists of an illustration followed by a listing of assemblies or components. It is arranged in columns, which show stock numbers, item identification, and other data necessary to maintain this equipment in an operative condition. Illustrations are placed either before, or in close proximity to, the component or assembly. The items are arranged in disassembly sequence.

a. Illustration (Column 1). This column is divided as follows:

(1) Figure Number. Indicates the figure number of the illustration in which the item is shown.

(2) Item Number. The number used to identify the item called out in the illustration.

b Source Maintenance Recoverability Code (Column 2). This column contains a series of alphabetic letters, which denote the uniform source, maintenance and recoverability coding structure. This Code is assigned to items subordinate to or associated with an end item, i.e., spares, repair parts and support equipment. The uniform code format is composed of three parts consisting of a two (2) position Source Code, a two (2) position Maintenance Code, and a one (1) position Recoverability Code.

(1) The code provides the user with information on each item relative to (1) the method of obtaining the item; for example, by requisition, fabrication or salvage; (2) the lowest maintenance level authorized to remove, replace and use the item and the lowest level capable to perform complete repair; and (3) disposition action on unserviceable items.

(2) Definitions of SMR codes are listed on page 20 of the preface. Sample SMR codes are:

(1) Source	(2) Maintenance		(3) Recoverability
	Use	Repair	
PA	F	F	A
PB	F	H	H
PC	O	Z	Z
AF	F	Z	Z
MF	F	F	F
KF	H	Z	Z
XA	F	Z	Z
XB	O	F	F
XC	H	Z	Z

DEFINITIONS AND APPLICATION OF SOURCE, MAINTENANCE, and RECOVERABILITY CODES

SOURCE CODES

<u>Code</u>	<u>Application/Explanation</u>
-------------	--------------------------------

Source codes (first and second position) are assigned to support items and indicate the manner of acquiring the items for maintenance, repair, or overhaul of end items. Source codes are entered in the first and second position of the uniform SMR code format.

SERIES A: ASSEMBLE, COMPLETE ASSEMBLY NOT STOCKED

Code "A" entered in the first position of the source code applies to items that are not procured as assemblies but are assembled within the Marine Corps prior to installation. The code entered in the second position designates the lowest level authorized to assemble the item. All the parts used in the assembly will be "P" coded.

AO	Item to be assembled at organizational maintenance level.
AF	Item to be assembled at intermediate maintenance level.
AH	Item to be assembled at intermediate maintenance level.

AD Item to be assembled at depot maintenance level.

SERIES K: ITEMS OF A KIT, NOT PURCHASED SEPARATELY

KD An item of depot overhaul/repair kit and not purchased separately. Depot kit defined as a kit that provides items required at the time of overhaul or repair.

KF An item of maintenance kit and not purchased separately. Maintenance kit defined as a kit that provides an item that can be replaced at organizational or intermediate levels of maintenance.

KB Items included in both a depot overhaul/repair kit and a maintenance kit.

SERIES M: MANUFACTURE, PARTS NOT PROCURED

Code "M" entered in the first position of the source code applies to items that are not procured but are capable of being fabricated or manufactured within the Marine Corps. These items have relatively low usage and will generally be fabricated or manufactured only as required for immediate repair or replacement. The code entered in the second position designates the lowest level authorized to manufacture or fabricate the item. Units will requisition the bulk materiel under the NSNs and the quantities indicated to effect the fabrication or manufacture of the item.

MO Item to be manufactured or fabricated at organizational level.

MF Item to be manufactured or fabricated at intermediate maintenance level.

MH Item to be manufactured or fabricated at intermediate maintenance level.

MD Item to be manufactured or fabricated at depot maintenance level.

SERIES P: PARTS PROCURED, SUPPLY SYSTEM STOCK

- PA Item procured and stocked for anticipated or known usage.
- PB Item procured and stocked for insurance purposes because essentiality dictates that a minimum quantity be available in the supply systems.
- PC Item procured and stocked and which otherwise would be code PA except that it is deteriorative in nature.
- PD Support item, excluding support equipment, procured for initial issue or outfitting and stocked only for subsequent or additional initial issues or outfitting. Not subject to automatic replenishment.
- PE Support equipment procured and stocked for initial issue or outfitting to specified maintenance repair activities.
- PF Support equipment which will not be stocked but which will be centrally procured on demand.
- PG Item procured and stocked to provide for sustained support for the life of the equipment. It is applied to an item peculiar to the equipment, which because of probable discontinuance or shutdown of production facilities would prove uneconomical to reproduce at a later time.

**SERIES X: NOT PROCURED, GENERALLY IMPRACTICABLE FOR STOCKING,
MAINTENANCE, OR MANUFACTURE**

Items listed in this publication, which are source coded XA or XB, may have been subsequently assigned an NSN because of other applications in the Marine Corps.

Therefore, if an item source coded in the XA or XB series in this publication is required, users are directed to first make the following investigations:

- a. Check the corresponding part number in FEDLOG, to determine if an NSN has been assigned.

- b. If an NSN has been obtained from the above check, refer to FEDLOG for the latest supply management decision regarding the stock number.
- c. Check stock for availability of part/parts having an NSN.
- d. If the review of stock discloses that materiel is not available, refer to FEDLOG for inventory record data regarding the preferred NSN, which may have been obtained in the FEDLOG review.
- e. Prepare a requisition citing the stock number shown in FEDLOG.

The above review will assist the user in obtaining the correct item of supply from the supply system, when available, rather than through alternate methods such as obtaining the desired part from salvage, requisitioning the next higher assembly, or recommending that the equipment be overhauled or retired. If a stock number for the desired item does not exist, then the source of supply as defined below will prevail:

- XA Item is not procured or stocked because the requirements for the item will result in the replacement of the next higher assembly.
- XB Item is not procured or stocked. If not available through salvage, requisition.
- XC Installation drawing, diagram, instruction sheet, field service drawing, that is identified by manufacturers' part number.

MAINTENANCE CODES

<u>Code</u>	<u>Application/Explanation</u>
-------------	--------------------------------

Maintenance codes are assigned to indicate the levels of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth position of the Uniform SMR Code Format as follows:

- a. USE Code (third position): The maintenance code entered in the third position will indicate the lowest maintenance level authorized to remove, replace, and

use the support item, as indicated by one of the following levels of maintenance.

- O Organizational.
- F Field. Intermediate.
- H Field. Intermediate.
- L Item is removed, replaced, used at designated Specialized Repair Activity.
- D Depot.
- Z Item is not authorized to be removed or replaced at any maintenance level. This code assigned to items not required for support in a specific application and is identified for reference purposes only.

b. REPAIR Code (fourth position): The maintenance code entered in the fourth position indicates whether the item is to be repaired and identifies the lowest maintenance level with the capability to perform complete repair. The decision to code the support item for repair at the indicated maintenance levels requires that all maintenance capability (remove, replace, repair, assemble and test) for the support items be provided to that level. This does not preclude some minor repair, which should be accomplished at a lower level of maintenance unless specifically excluded by the appropriate code (i.e., L).

- O Organizational.
- F Field. Intermediate.
- H Field. Intermediate.
- K Repairable item. Repair, condemnation, and disposal to be performed at Contractor facility.
- D Depot.
- L Repair restricted to designated Specialized Repair Activity.
- Z Non-repairable. No repair is authorized.

- B No repair is authorized. The item may be reconditioned by adjusting, lubricating, etc., at the user level. No parts or special tools are procured for the maintenance of this item.

RECOVERABILITY CODES

<u>Code</u>	<u>Application/Explanation</u>
-------------	--------------------------------

Recoverability codes (fifth position) are assigned to support items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the uniform SMR code format.

- | | |
|---|--|
| Z | Non-reparable item. When unserviceable, condemn and dispose of at the level indicated in position 3. |
| O | Reparable item. When uneconomically repairable, condemn and dispose of at organizational level. |
| F | Reparable item. When uneconomically repairable, condemn and dispose of at field maintenance level. |
| H | Reparable item. When uneconomically repairable, condemn and dispose of at field maintenance level. |
| D | Reparable item. When beyond lower level of repair capability, return to depot. Condemnation and disposal not authorized below depot level. |
| L | Reparable item. Repair, condemnation and disposal not authorized below depot level. |
| A | Item requires special handling or condemnation procedures because of specific reasons (i.e., precious metal content, high dollar value, critical material). Refer to appropriate manuals/directives for specific instructions. |

c. Stock Number (Column 3). This column furnishes National Stock Numbers (NSNs) assigned to those centrally managed items required for the support of the equipment. When they have been assigned, NSNs will be used in all supply operations, from original purchase to final disposal of the item. Absence of an

NSN indicates the item is not normally stocked as a repair part, as indicated by the source code portion of the SMR codes. If an item without an NSN is required, it should be determined if the item can be obtained from assembly, manufacturer or salvage by referring to the source code. Items not stock numbered, that cannot be obtained from these sources, may be requisitioned using the CAGE code, part number and referencing the technical manual number, date of the technical manual, Figure and item number and the page number, which applies.

d. Commercial and Government Entity (CAGE) (Column 4). The CAGE codes are five position codes assigned to the manufacturers/non-manufacturers organizational entities/Contractors. The CAGE code is used in conjunction with the firm's reference number relating the firm with the item of supply, production or design in cataloging and other supply record, as well as on engineering documentation. The codes are essential to contract/purchase agreements and various activities/agencies automated data processing (ADP) systems. The CAGE code and reference number are used to screen item identifications against each other primarily to detect duplication.

e. Part Number (Column 5). Indicates the primary number used by the manufacturer (individual, company, firm, corporation or government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards and inspection requirements to identify an item or range of items.

NOTE

When an NSN item is requisitioned, the item received may have a different part number than the part being replaced.

f. Description (Column 6). Indicates the Federal item name and, if required, a minimum description to identify the items. Items that are included in kits and sets are listed below the name of the kit or set with the quantity of each item in the kit or set indicated in the quantity incorporated in column. When the part used differs between serial numbers of the same model, the effective serial numbers are shown as the last line of the description.

g. Replace (Column 7). This column is divided as follows:

- (1) ECO column indicates items that have been determined to be economically cheaper to replace during repair than to expend the man-hours necessary to fully inspect each item.
- (2) MAN column indicates items that must be replaced any time they are loosened or removed.

No X in either column indicates the item has special inspection procedures or this item is further disassembled and a subsequent page will cover the components.

h. Unit of Measure (U/M) (Column 8). Indicates the standard of the basic quantity of the listed item as used in performing the actual maintenance function. The measure is expressed by two-character alphabetical abbreviation (e.g., ea, in, pr, etc.). When the unit of measure differs from unit of issue, the lowest unit of issue that will satisfy the required units of measure will be requisitioned.

i. Quantity Incorporated in Unit (Column 9). Indicates the quantity of the item used in the breakdown shown on the illustration figure, which is prepared for a functional group, sub-functional group, or an assembly. An "AR" appearing in the column in lieu of quantity is applicable (e.g., shims, spacers, etc.).

j. Special Information. Circled key callouts on the Repair Parts Illustration figures are to indicate items that must be replaced during repair of an item in order to return that item to 100% functionality and 90% service life according to repair standard requirement.

k. NSN Index. A list in NSN sequence containing part numbers, CAGE codes and NSNs which are cross-referenced to each illustration figure and item number appearance.

l. Part Number Index. A list in part number sequence containing part numbers, CAGE codes and NSNs which is cross-referenced to each illustration figure and item number appearance.

3.4.1.10. Appendix X - Reference Publications. A list of the manuals that pertain to system and system equipment, and other

documents of interest, such as training materials/courseware and manuals for associated systems equipment shall be included.

3.4.1.11. Appendix X - Expendable/Durable Supplies and Materials List. This appendix lists supplies and materials needed to operate and maintain the TSM.

a. Explanation of Columns.

Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g. "Use cleaning compound, item 5, App.A").

Column (2) - Maintenance Level. This column identifies the lowest level of maintenance that requires the listed item.

O	=	Organizational
I	=	Intermediate
D	=	Depot

Column (3) - National Stock Number. This is the NSN assigned to the item; use it to request or requisition the item.

Column (4) - Description. Indicates the Federal Item Name and, if required, a description to identify the item. The last line for each item indicates the part number and CAGE code.

Column (5) - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetic abbreviation (e.g., EA, in). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy the requirements.

3.4.1.12. Appendix X - Special Tools and Test Equipment. A list of all special tools and test equipment for system-level maintenance shall be included. Special tools are defined, as those tools not listed in the tool kit normally assigned to the required maintenance person in the Marine Corps unit when that person is deployed.

b. Explanation of Columns.

Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the tool or test equipment

Column (2) - Maintenance Level. This column identifies the maintenance level allocated the tool or test equipment.

Column (3) - National Stock Number. This is the NSN assigned to the specific tool or test equipment.

Column (4) - Nomenclature. This is the noun name of the tool or test equipment.

Column (5) - Tool Number. List the manufacturer's part number and CAGE for the tool.

3.4.1.13. Appendix X. Components Inventory List with Illustrations. Appendix X shall contain illustrations, technical data, and identification data on collateral and collection-type items within the Marine Corps. The components to be issued with the end item shall be identified under the heading of "SUPPLY SYSTEM RESPONSIBILITY" and when required, under the heading "COLLATERAL MATERIEL." End items requiring collateral materiel are governed by whether the end item is initial or replacement issue. The Commander, Marine Corps Logistics Bases, 814 Radford Boulevard, Albany, Georgia 31704-1128, will direct whether the issue of the end item is with collateral materiel or without collateral materiel. Items listed under "USING UNIT RESPONSIBILITY" heading are to be requisitioned separately through the supply system when applicable. Using units are also responsible for requisitioning the required publications to support the end item identified by the ID number shown on the cover of the TM. The end item will be complete when the total quantity of items, as applicable, shown in the components list is on hand. (See Attachment 3 as an example.)

3.4.1.14 Appendix X - GLOSSARY. Abbreviations and definitions.

3.4.1.15. Appendices. Include additional appendices as applicable to identify appropriate related technical information and procedures (exclusive of administrative procedures).

3.4.1.16. Index. Not required in an ETM with the table of contents bookmarked or linked.

3.5. ETM Changes. Changes to the ETM, including those resulting from engineering change proposals, shall be submitted by issuing a new, updated, CD-ROM. Changes to electronic files, which make up the ETM, are to be provided using the same guidance by which the basic ETM was written.

4.0. QUALITY ASSURANCE PROVISIONS

4.1. Quality Assurance Functions. All TM elements and processes shall be evaluated at various stages of development/revision, by one or all of the following quality assurance functions:

- a. Quality reviews.
- b. Quality program reviews.
- c. In Process Reviews (IPR).
- d. Validation.
- e. Verification.

4.1.1. Control of Subcontractors and Vendors. The Contractor shall ensure the quality of TMs prepared by subcontractors and vendors.

4.1.2. IPRs

4.1.2.1. The Government requires IPRs at stages of TM development (a minimum of 30% and 80%) to provide for coordinated monitoring of TM preparation by the Contractor and the Government. An ETM shall be at the 30% completion stage when the following items are completed. The structure/outline and proper format of the ETM have been defined. The hyperlinking approach has been established. Front matter (including warning and cautions), most introductory and equipment descriptions have been written and placed in the appropriate chapters. Known tables and figures are complete and placed in the appropriate chapters. Gathering of copyright releases of commercial equipment has begun. An ETM shall be considered at 80% when the following is completed. All front matter (cover, title page, table of contents and warning and cautions) are complete and

placed in the appropriate places. The content of each chapter including descriptions, step-by-step procedures, tables, figures and warning, cautions and notes are written although they may be missing a minimal amount of technical data. The content in the chapters must flow in a clear and logical sequence and be written in the correct format. A table of contents is complete and correctly links to the appropriate chapter, paragraph, table or figure, etc. The 80% review will consist of a paper review and a review to verify the linking on the CD. Most of the copyright releases have been received. The Contractor shall support IPRs and provide access to TM materials, intermediate products, and final products. Upon request, the Contractor shall provide to the Government the most current ETM on CD-ROM for review prior (a minimum of 14 calendar days) to the scheduled IPR. The Contractor shall provide one ETM (on CD-ROM) to each IPR participant. The IPRs shall include evaluation of:

- a. Source data.
- b. TM plan/outline.
- c. Presentation methods.
- d. Modes of preparation.
- e. TMCR compliance.
- f. Completed documentation (electronic, text & artwork).
- g. Current ETM development (ETM on CD-ROM).
- h. Current PDF files.

4.1.2.2. IPR Records. The Contractor shall act on reported decisions/discrepancies resulting from or associated with IPRs. Each review shall include corrections from the previous IPR, if applicable. Comments and redline resulting from reviews shall be incorporated. Previous comments from any IPR shall be revisited prior to proceeding with the current IPR. If the previous comments have not been included, the IPR shall not be considered complete.

4.1.2.3. Disposition of IPR Findings. Discrepancies and/or deficiencies found as a result of the IPR shall be corrected prior to certification and acceptance of the ETM.

4.1.3. Guidance Conference. A start of work guidance conference shall be held at Contractor's facility to ensure a basic understanding of the requirements of this TMCR. This conference

shall be held in conjunction with the contract Post Award Conference

4.1.4. Validation. Validation is a Contractor, quality assurance responsibility accomplished on all TMs, changes, supplemental data, and revisions thereto. Validated manuals are required for testing and training. The ETM shall not be ready for validation until the following conditions have been fulfilled.

a. Contractor's engineering technical review has been completed.

b. Information, illustrations and parts lists reflect correct configurations of the system/equipment, to include all engineering changes.

c. Procedural instructions are readily understandable by the intended user and adequate to perform all operations and maintenance functions.

d. All procedures have been performed to assure accuracy and performance requirements.

e. Adequacy of data is checked to ensure that it supports the approved maintenance and support plan.

f. Hardware of the proper configuration is available for the validation and verification effort.

g. All safety hazards identified in the safety assessment report are resolved and identified within the text as cautions or warnings necessary to protect the equipment or personnel as appropriate.

h. The use of any hazardous material has been identified. The Contractor shall address, as a minimum, the hazardous materials listed in the Environmental Protection Agency's list.

i. Upon completion of Validation, the Contractor shall provide a signed **Validation Certificate** testifying to the completeness, accuracy and safety of the ETM. This may be a locally designed form, but shall be signed by an authorized official of the company.

4.1.5. Verification. An ETM shall not be ready for verification until the Contractor furnishes a validation certificate signed by a responsible person assigned to indicate validation is complete. The Government will verify that the ETM is accurate during Verification. Contractor shall provide system equipment, technical/engineering support and facilities as required to aid Government in the performance of verification effort. The Contractor shall provide one set of ETM(s) on CD ROM to each verification participant, no less than 14 calendar days prior to the scheduled verification effort. The Contractor shall incorporate all Government comments from specification compliance-reviews, technical accuracy reviews and Government verification reviews into final submission of the ETM. Correction of discrepancies or changes resulting from Government training, testing, and reviews shall be provided for use and incorporation into the production ETM. Documents requiring 15% or more corrections will be deemed unacceptable by the Government.

5.0. PACKAGING AND DELIVERY

5.1 Packaging

5.1.1 Marking. In addition to sender and addressee information, the exterior of each package shall bear the following:

- (1) Publication number.
- (2) Contract or Purchase Order Number.
- (3) Type of material enclosed.
- (4) Number of containers in the shipment.

5.1.2 Packing List. A copy of the letter of transmittal, or the packing list, shall be placed inside the package. When a shipment consists of several packages, the letter of transmittal or packing list shall be enclosed in the first package and shall identify the material that was wrapped in each package.

5.1.3 CD-ROM for Review. CD-ROM shall be wrapped to provide maximum protection during shipping. Each CD-ROM shall be delivered in a standard, compact, digital, audio, disk case and wrapping. The case is to be usable as storage for the disk once

the plastic cover wrapping is removed. Multiple CD copies may be delivered in the same shipping container. CD-ROMs are to be delivered as specified on the Distribution Matrix of the CDRL.

5.2. Delivery Instructions

5.2.1 ETM. The draft ETM shall be provided for use with prototype hardware systems. The final ETM shall be provided for Government verification. Only verified ETMs shall be provided for fielding with production hardware systems. A Master CD final submission shall be made 30 days after incorporation of changes resulting from Government verification or final review. Upon Government approval of the ETM, two CD-ROMs shall be over-packed with each end item. A copy of the ETM Master (CD-ROM) shall be delivered to MARCORSYSCOM only. Manuals shall be submitted to the Government by DD-250.

5.2.2. Commercial Manuals. The Contractor shall install all commercial manuals, with supplements, if applicable, in PDF files on the same CD-ROM as the ETM.

5.2.3. MS Word Files. Copies of all MS Word files created to produce the TSM system manual and commercial manual supplements shall be delivered to MARCORSYSCOM. All word files shall be delivered on a separate CD-ROM.